

PATENT  
ATTY DOCKET NO. 0212-0001

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: Rebecca A. Frana-Guthrie et al. )  
Title: Cooling Package for )  
Agricultural Combine )  
Serial No: 10/053,514 )  
Confirm. No: 1677 )  
Filing Date: October 25, 2001 )  
Art Unit: 3753 )  
Examiner: Ljiljana V. Ciric )

## Certificate of Transmission

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office, fax number 703-872-9306 on the date indicated below.

Signed: Michael R. Mischnick

Michael R. Mischnick

Dated: May 10, 2004

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**APPLICANT REBECCA A. FRANA-GUTHRIE**

As an inventor named in the above-identified patent application, I, Rebecca A. Frana-Guthrie, make the following declaration concerning the invention and its background.

1. I am a Senior Designer at Deere & Co. I have been working in the field of agricultural combines for about 27 years, all of which have been with Deere & Co.
2. With about 65% of the market and about \$7 Billion in sales per year, Deere & Co. has the largest market share in the North American agricultural equipment industry.
3. One aspect of our invention, see amended claim 1, is a subassembly for a cooling package for use in an agricultural combine including a charge air cooler bolted to a radiator. The upstream radiator face and the upstream charge air cooler face are aligned generally in a common plane to form an upstream subassembly face. A line to line fit between the charge air cooler and the radiator creates a metal to metal seal.
4. In another aspect, see amended claim 3 and other claims, the subassembly is placed in a frame having a flange so that the outer perimeter of the subassembly face seals against the flange.
5. Combines are as tall as 15 feet and as heavy as 32,000 pounds, requiring as much as several hundred horsepower, which makes heat rejection critical.

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6. Combines operate over rough terrain in dirty, dusty, chaff-laden environments. Chaff and dust are said to “blind over” the faces of heat exchangers, reducing air flow and cooling capacity. Frequent, vigorous cleaning, e.g., rough scraping or power washing, is required. Between cleanings it is desirable to maximize heat exchanger efficiency by forcing as much air as possible through the heat exchangers by eliminating “leak paths” around or between the heat exchangers.

7. Because combines move slowly through fields, they do not encounter strong cooling winds and, in order to minimize intake of dust and chaff, their cooling packages usually face laterally, see FIG. 5. By way of comparison, U.S. Patent 4,651,816 to Struss and U.S. Patent 4,736,727 to Williams, both cited by the examiner, disclose heat exchangers placed behind the grille of an automobile or semi-truck, respectively. The Struss and Williams heat exchangers are designed for chaff-free environments enjoying considerable “ram air” at highway speeds. In contrast, neither clean air nor ram air are available in combines.

8. Combines may be designed for any of several crops and climates and corresponding heat loads. Various sizes of radiators and charge air coolers have been mounted in an oversized frame with gaps between and around the components. For many decades, foam pieces have been crammed into gaps in an attempt to eliminate leak paths. But foam pieces wear away and fall out when the combine moves over rough terrain in hot, humid, dusty, chaff-laden conditions punctuated by frequent, vigorous cleaning.

9. In order to overcome the problems of the prior art, we invented a cooling package subassembly for a combine, as claimed in amended claim 1, including a radiator and a charge air cooler bolted together in a line-to-line fit for a metal-to-metal seal. The new cooling package subassembly permits unitary installation, effectively eliminates leak paths between heat exchangers, increases seal reliability, and eliminates the need for a foam seal between components, thereby solving a plethora of problems in manufacturing, operation and maintenance.

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10. Similarly, the innovative flange between the frame and outer perimeter of the subassembly face, as in amended claim 3 and other claims, effectively seals and eliminates leak paths around the components.

11. The inventive cooling package has satisfied a long felt need and it has been a commercial success for Deere & Co., saving manufacturing time and expense. Deere & Co. has sold about 12,000 combines with the new cooling package, for an average retail price of about \$190,000, for total sales of about \$2 Billion.

I declare that all statements made herein of my own knowledge are true and that all statements made herein on information and belief are believed to be true. I understand that willful false statements and the like are punishable by fine or imprisonment, or both, and may jeopardize the validity of the application or any patent issuing thereon.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 10th day of May, 2004.

Signed



Rebecca A. Frana-Guthrie